

## User Manual

# AMx58x P

## Description

Lika's Programmable Encoder is designed to be a very flexible replacement for any absolute encoder version with parallel or serial SSI output. The encoder can be easily programmed via RS232 interface using any common terminal software (e.g. Hyper Terminal®).



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## 1 – Safety summary

- Safety instructions serve for the protection of health and safety standards at work and the prevention of accidents. Please observe them strictly.
- Your device has been quality controlled, tested and it's ready for use. Please respect all information and advices which are on the device and on this manual.
- Work on this device must only be carried out by qualified personnel.
- Repairs should be carried out only at our factory. If any information is missing or unclear, please contact the LIKA's sales staff.

## 2 – Identification

The device can be identified by the label's data (ordering code, serial number). This information is listed in the delivery document. The technical features of the product can be determined by the ordering code.



File: E211871

## 3 – Installation

Install the device according to the protection level provided.

Protect it against knocks, dust, solvents and extreme temperatures.

## 4 – Mounting steps

In order to guarantee the maximum life of mechanical parts of the encoder, we recommend to use a flexible coupling between the encoder and the motor shaft.

**IMPORTANT:** You are strongly recommended not to carry out any mechanical operations (drilling, milling...) on the encoder's shaft. This could cause serious damage to the internal parts and the immediate warranty loss.



## 5 – Electrical connections

We recommend to follow the instructions below:

- This device is to be supplied by a Class 2 Circuit or Low-Voltage Limited Energy or Energy Source not exceeding 30 Vdc.
- While connecting, power must be switched OFF.
- Check correct lines and connections before switching ON the device.
- We recommend that the device has to be mounted as far as possible from any capacitive

or inductive noise source such as motors, relays and switching devices.

- Avoid routing the cable near high voltage power cables in order to reduce influences of electric noise.
- Only use shielded cables and wire with a cross section between 0,14mm<sup>2</sup> and 0,5 mm<sup>2</sup>.
- The shield of the cable and 0Vdc wire should be connected to ground (GND).
- Electric noise sources should be linked with noise suppression filters.
- Total length of connection cable from should not exceed 50 m (55').
- Connect according the pin-out supplied.

### E41MLS (41 pin standard connector)

Pin	Function	Pin	Function
A	Out 1(LSB)	Y	Out 22
B	Out 2	Z	Out 23
C	Out 3	a	Out 24
D	Out 4	b	Out 25 (MSB)
E	Out 5	c	Parity bit
F	Out 6	d	Zero setting
G	Out 7	e	Latch
H	Out 8	f	TxD
J	Out 9	g	RxD
K	Out 10	h	GND (RxD, TxD)
L	Out 11	i	Tristate
M	Out 12	j	Reset
N	Out 13	k	Preset 1
P	Out 14	m	Preset 2
R	Out 15	n	n.c.
S	Out 16	p	n.c.
T	Out 17	q	n.c.
U	Out 18	r	Complementary
V	Out 19	s	+10Vdc +30Vdc
W	Out 20	t	0Vdc GND
X	Out 21		

### E32MLS (option "V", 32 pin connector)

Pin	Function	Pin	Function
A	Out 1(LSB)	T	Out 17
B	Out 2	U	Out 18
C	Out 3	V	Out 19
D	Out 4	W	Out 20
E	Out 5	X	Out 21
F	Out 6	Y	Out 22
G	Out 7	Z	Out 23
H	Out 8	a	Out 24
J	Out 9	b	Out 25 (MSB)
K	Out 10	c	Parity bit
L	Out 11	d	Zero setting
M	Out 12	e	Latch

N	Out 13	f	TxD
P	Out 14	g	RxD
R	Out 15	h	+10Vdc +30Vdc
S	Out 16	j	0Vdc GND

### EML121 (12 pin connector, SSI output)

Pin	Function	Pin	Function
1	clock -	7	Zero setting
2	clock +	8	Complementary
3	data +	9	Preset 1
4	data -	10	Preset 2
5	TxD	11	+10Vdc +30Vdc
6	RxD	12	0Vdc GND

### 40 wires cable

Colour	Function	Colour	Function
brown	Out 1(LSB)	white/pink	Out 21
red	Out 2	white/grey	Out 22
pink	Out 3	pink/brown	Out 23
yellow	Out 4	grey/brown	Out 24
green	Out 5	brown/black	Out 25 (MSB)
blue	Out 6	white/black	Parity bit
violet	Out 7	grey/green	Zero setting
grey	Out 8	yellow/grey	Latch
white	Out 9	pink/green	TxD
black	Out 10	yellow/pink	RxD
brown/red	Out 11	green/blue	GND (RxD, TxD)
white/red	Out 12	yellow/blue	Tristate
blue/red	Out 13	green/red	Reset
pink/grey	Out 14	yellow/red	Preset 1
white/yellow	Out 15	green/black	Preset 2
brown/green	Out 16	yellow/black	n.c.
white/green	Out 17	pink/blue	n.c.
yellow/brown	Out 18	grey/red	Complementary
white/blue	Out 19	pink/red	+10Vdc +30Vdc
brown/blue	Out 20	grey/blue	0Vdc GND

### 16 wires cable, SSI output

Colour	Function	Colour	Function
brown	clock +	grey	Preset 2
red	clock -	black	GND (RxD, TxD)
pink	data +	white	Reset
yellow	data -	red/blue	Zero setting
green	TxD	pink/grey	Complementary
blue	RxD	white/yellow	+10Vdc +30Vdc
violet	Preset 1	yellow/brown	0Vdc (GND)

## 6 - Functions and settings

### 6.1 Function of inputs

#### Reset (active at 0Vdc GND)

Resets all the last encoder's parameters memorized.

#### Zero setting (Datum value)

Sets the encoder's actual position to zero (0) and includes previously set offset value (see OFST parameter).

New actual position = 0 + Offset.  
 Input has to be active min. 3,5 µs.  
 Input  $\geq 10\text{Vdc}$  : zero setting (min. 3,5µs)  
 Input  $< 8\text{Vdc}$  : function not enabled

### Complementary (counting direction)

Allows to change counting direction by means of an input signal. Status of the input is checked only while switching on the encoder.  
 Input  $\geq 10\text{Vdc}$  : counter clockwise counting  
 Input  $< 8\text{Vdc}$  : clockwise counting (standard)

### RXD, TXD (RS232)

Serial interface port for parameter settings and data read-out.  
 RS232 parameters:  
 Baud rate = 9600 baud  
 Data = 8 bit, stop=1 bit  
 Flux control = Xon/Xoff

### Parity

Allows to control functioning of encoder outputs and connection integrity. Parity bit output is active (high) when the sum of active output bits (high) in even or odd (see parameter |EVEN and |ODD).

### Latch

Allows the storage of the position value which the encoder shows in output at a particular moment. The above mentioned position value will remain present in output until the LATCH signal is deactivated. In this way it is possible, if for instance the data transmission speed of the encoder is fast in comparison to the data acquisition time of the interface electronics, to freeze the position for the amount of time necessary for the data to be acquired.

Input  $> 10\text{Vdc}$ : position freezed (Latch activated)  
 Input  $< 8\text{Vdc}$ : Latch not activated

### Tristate

Allows the transmission of output information from the encoder to be blocked. In this it is possible to work with several encoder in parallel (multiplexing) using a single control unit, acquiring the information values relative to the angular position of each encoder with an updating time equal to the duration of the multiplexing cycle.  
 Input  $> 10\text{Vdc}$  : encoder enabled (Tristate activated)

Input  $< 8\text{Vdc}$  : encoder not enabled (Tristate not activated).

### Preset1/Preset2

The Preset1 and Preset2 inputs are necessary for the teach-in function of encoder resolution (see PRST1 and PRTS2 parameters).  
 Input  $> 10\text{Vdc}$  : teach-in activated  
 Input  $< 8\text{Vdc}$  : teach-in not activated

### 6.2 RS232 communication

To start communication between encoder and PC run the file **Lika\_com.ht\*** or set-up connection parameters as follows:  
 (\*delivered with encoder and downloadable on [www.lika.biz](http://www.lika.biz))

e.g. with Hyper Terminal®

- run Hyper Terminal®
- menu "File" -> "New Connection"
- enter any file name -> press OK
- in "Connect to" window
- set "Connect using" to "Direct to Com1" -> press OK
- in "Port settings" window set
 

<b>Bits per second</b>	<b>9600</b>
<b>Data bits</b>	<b>8</b>
<b>Parity</b>	<b>No</b>
<b>Stop bits</b>	<b>1</b>
<b>Flow control</b>	<b>Xon/Xoff</b>
- menu "File" -> "Properties"
- select "Settings" folder
- set tag on "Terminal keys"
- parameter "Emulation" select "VT100"
- enter in "ASCII Setup"
- set "Line Delay" to value 100
- set "Character Delay" to value 10
- set tag "Force incoming data to 7-bit ASCII"

**NOTE:** A complete sequence of commands can be saved as a text file (.txt) and sent directly to the encoder.

e.g. Hyperterminal®

menu "Transfer" -> "Send Text File"

## 6.3 Communication commands list

### |DEV (1, 127) "DEvice"

Sets device address of the encoder. If several encoders are connected to network it is necessary to set a different device address to each encoder separately. Communication can be activated by |ADDR command.

Default: **0**

Syntax: |DEV=xxx

Value range: from **1** to **127**

### |ADDR (1, 127) "ADDRess"

Activates communication with a certain encoder (address must be previously assigned by |DEV command)

Syntax: |ADDR=xxx (where xxx=encoder address)

At prompt ">" encoder is ready to receive commands from the PC. To open a communication channel with another encoder it is necessary to exclude the previous one.

Note: Each Lika's programmable encoder accepts address zero (0), which allows to communicate even if the real address is unknown.

### |RST "ReSeT"

Resets all encoder parameters to default condition (factory setting).

Syntax: |RST

## 6.4 Encoder output settings

### |BIN "BINary"

Sets Binary output code (default setting).

Syntax: |BIN

BIT \ INF	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1																
2																
3																
4																

### |GRAY "GRAY"

Sets Gray output code.

Syntax: |GRAY

BIT \ INF	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1																
2																
3																
4																

### |BCD "BCD"

Sets BCD output code.

Syntax: |BCD

BIT \ INF	0	1	2	3	4	5	6	7	8	9
1										
2										
3										
4										

### |NS (1, 4096 o 8192) "Number of Steps"

Sets single turn resolution (counts per revolution).

**NOTE:** Resolution cannot be set higher than physical encoder resolution (4096 CPR if AMx58x12... or 8192 CPR if AMx58x13...).

Syntax: |NS=xxxx

Value range: from **1** to 4096 or 8192 (see note)

### |NR (1, 4096) "Number of Revolutions"

Sets multiturn resolution (number of revolutions).

**NOTE:** Resolution cannot be set higher than physical encoder resolution.

Syntax: |NR=xxxx

Value range: from **1** to **4096**

**ATTENTION:** Do not exceed the number of revolutions programmed to avoid rounding error.

### Rounding error

When you program number of revolutions which is not a sub multiple of 4096, a rounding error will occur when you overtake the encoder's cycle (4096 rev.).

## Example 1

Desired nr. of revolutions = 6

Encoder cycles =  $4096 / 6 = 682,666...$

This means that the encoder has to complete 4096 physical revolutions within 682,6 cycles. As this is not an integer number, a rounding error will occur after completing the 4096 physical revolution.

The number of revolutions which can be completed without error are:  $6 \times 682 = 4092$ .

After 4096 physical revolutions the Encoder will show zero position.

Therefore the rounding error will be  $4096 - 4092 = 4$  rev.

## Example 2

Desired nr. of revolutions = 4

Encoder cycles =  $4096 / 4 = 1024$

The number of revolutions which can be completed without error are:  $4 \times 1024 = 4096$

Rounding error will be  $4096 - 4096 = 0$  rev.

### |CLW "ClockWise"

Sets clockwise counting sequence seen from shaft side (default setting).

Syntax: |CLW

see also |EXTD command!

### |CCLW "CounterClockWise"

Sets counter-clockwise counting sequence seen from shaft side.

Syntax: |CCLW

see also |EXTD command!

### |EXTD "EXtErnal Direction"

Enables hardware complementary input (default).

See chapter 6.1 "**Complementary (counting direction)**"

If the counting direction is set by software command (|CLW, |CCLW), the hardware complementary input will be disabled until a new |EXTD command is send.

Syntax : |EXTD

### |EVEN "Parity bit EVEN"

Sets parity bit even. Parity bit will be logic level low when the sum of output bits with logic level high is even.

Syntax : |EVEN

### |ODD "Parity bit ODD"

Sets parity bit odd. Parity bit will be logic level low when the sum of output bits with logic level high is odd.

Syntax : |ODD

### |POFF "Parity bit OFF"

Parity bit disabled

Syntax : |POFF

### |ZERO "ZERO setting"

Sets actual encoder position to zero (0). Zeroing includes previously set offset values (OFST). See also chapter 6.1 "**Zero setting**"

Syntax: |ZERO

### |OFST (0, |NS x |NR) "OffSeT"

Sets offset value (e.g. tool correction). This value is added to actual value.

**Note:** To be active this command has to be sent before zeroing the encoder.

Syntax: |OFST=x

Value range: from 0 to NS x NR (total resolution).

## 6.5 Teach-in function

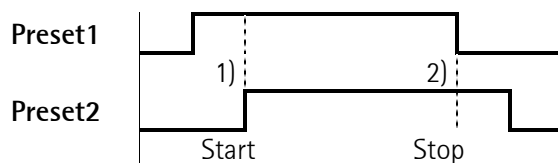
Teach-in function allows the encoder to set the needed resolution along the measurement length itself.

Syntax: |PRST1=x / |PRST2=x

Value range: from 0 to NS x NR (total resolution).

Step by step procedure:

- determine to end points along the measurement length (Start e Stop);
- determine the desired resolution along the measurement length (total resolution encoder has to show from Start to Stop)
- (e.g. 1000 positions);
- set start position by |PRST1 command (e.g. |PRST1=100);
- set stop position by |PRST2 command (e.g. |PRST2=1100).



1) beginning of teach-in / 2) end of teach-in

- move encoder next to Start position and activate Preset1 input (high).
- move encoder to Start position and activate Preset2 input (high).
- move encoder along the measurement length until Stop position.
- deactivate Preset1 input (low) when encoder reached Stop position.
- after gear factor calculation encoder will show the actual value of Stop position (1099\*).
- deactivate Preset2 input (low) to terminate teach-in procedure.

(\* as result of the above example the measurement length is 1000 steps, from position 100 to 1099).

### ATTENTION:

- the desired resolution cannot exceed physical resolution (4096 x 4096 or 8192 x 4096);
- do not pass zero position while teaching-in; Zeroing on Start position is recommended;
- counting sequence has to be positive from Start to Stop positions;

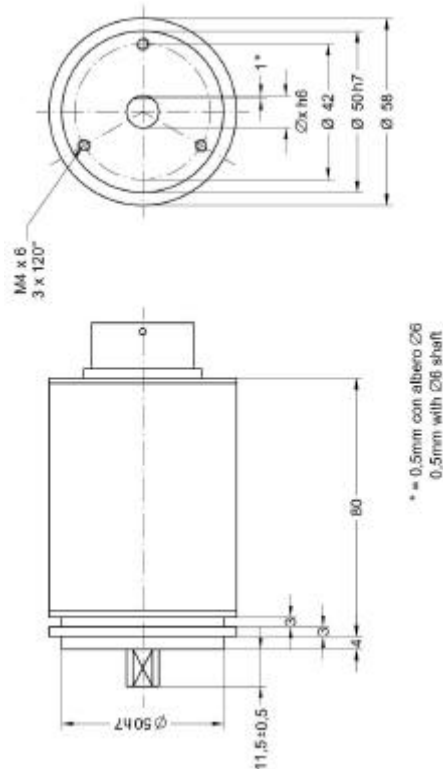
If any error occurs while teaching-in the encoder will deactivate all outputs (level low).

## 6.6 Serial interface messages

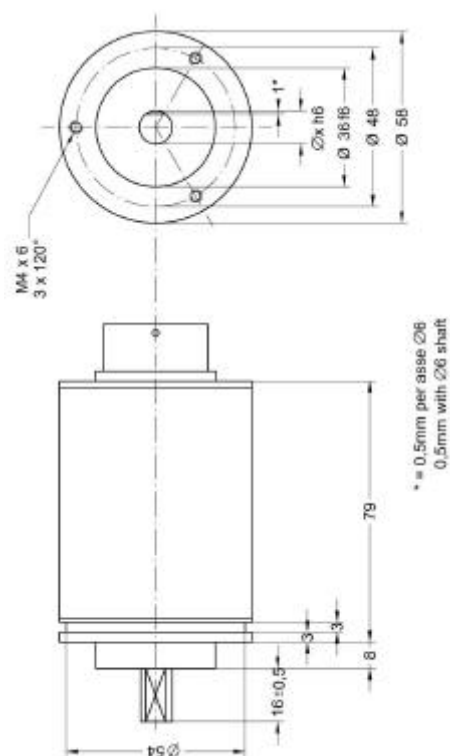
Symbol	Message
>	correct communication
?	command error
!	value out of range

## 7 - Dimensional drawing

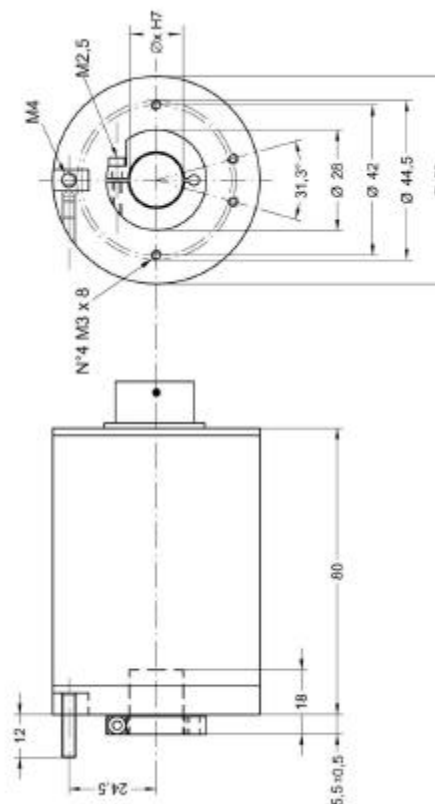
### 7.1 AM58 P

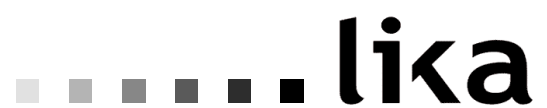


### 7.2 AM58S P



### 7.3 AMC58 P





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